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FOREST SURVEY RELEASE NO. 38

NOVEMBER 3, 1938

FOREST RESOURCES OF CENTRAL AND SOUTH FLORIDA

A Progress Report

by

THE SOUTHERN FOREST SURVEY

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Regional Survey Director

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FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release, which should be regarded only as a progress report, is based on a field survey made Dec. 21, 1935, to Apr. 18, 1936. It contains Forest Survey data that will be included in complete reports to be published later and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds; while item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it is to be noted that, owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Staff Assignment

Preparation of Report	- A. R. Spillers, Associate Forest Economist
In Charge of Field Work	- W. E. Houser, Associate Timber Expert
In Charge of Computations	- P. R. Wheeler, Associate Forest Economist

Note: The Southern Forest Experiment Station hereby wishes to acknowledge the clerical assistance received from the Works Progress Administration in the preparation of this Release.

FOREST RESOURCES OF CENTRAL AND SOUTH FLORIDA

General Description

The part of Florida treated in this report includes the more than two-thirds of the "peninsula" of the State extending south of the Withlacoochee River to the tip of the State. For greater ease in description and discussion, this area has been divided into two parts: central Florida, with 20 counties lying generally north of Lake Okeechobee; and south Florida, with 10 counties occupying the southern tip of the State (see map, fig. 1). This is Florida's tourist playground and the center of citrus and truck-crop production. The tourist trade, estimated to bring into the State between 200 and 300 million dollars annually, is probably its greatest industry, and is followed in importance by agriculture and forest industries. Miami, Tampa, and St. Petersburg are the largest cities and the principal seaports. Although the forests, which play an important role in making this entire area attractive to tourists, generally have been severely burned and cut, they still claim approximately 54 percent of the land area (table 1) and furnish raw materials for many forest industries. Longleaf pine predominates in central Florida, and slash pine and cypress in south Florida.

Lying entirely within the Coastal Plain, the area is generally low and flat with expanses of swamps and prairies, although in the ridge of sand hills that run southward through the middle of central Florida are found elevations that rise to about 300 feet above sea level. The area contains hundreds of lakes, of which the largest, Lake Okeechobee, is about 30 miles wide; and the numerous slow-moving streams provide only poor drainage for most of this section. The famous Everglades, a large expanse of saw-grass marsh dotted in many parts with "islands" of cypress and hardwood, is the dominant topographic feature of south Florida.

Soils in central Florida are generally sandy, with the soils of the Norfolk series on the hills and those of the Leon with its characteristic "hardpan" in the flatwoods. In south Florida, swamp and peat soils are commonly found around and south of Lake Okeechobee and in a strip along the Gulf Coast; while sandy soils (usually of the Leon series) occur upon the higher land west of the Lake and in a long narrow strip along the East Coast. Limestone rock underlies much of the area, outcropping in many places in south Florida.

Excellent transportation facilities are available except in the Everglades and in the Big Cypress Swamp in Collier County. The Florida East Coast Railway, the Seaboard Air Line, the Atlantic Coast Line, and several other lines serve the area. There is an excellent road system involving many hard-surfaced highways and country roads. There are several ports with deep-water harbors including Tampa, St. Petersburg, Miami, and Key West; and the Intra-coastal Canal has been improved recently along the Atlantic Coast as far south as Miami. Water-transportation facilities for barges and small craft are also available on the St. Johns, the Withlacoochee, and the Caloosahatchee Rivers, on Lake Okeechobee, and on some of the drainage canals.

The rapidly growing population was 777,000 in 1930, and, unlike in the remainder of Florida, more than six-tenths of the people live in towns and cities of 2,500 or more. Either directly or indirectly, the majority of the people are dependent upon the tourist business, which is at its peak in the winter and is centered chiefly along the coasts and in the "lake and hill" region. Agriculture is important, although of the total area of 18 million acres, only $2\frac{1}{4}$ million is included in farms; less than one-third of this is cropland, according to the Agricultural Census of 1935. Both the total area in farms and that in cropland showed rapid increases from 1930 to 1935. Agriculture is chiefly concerned with citrus and truck crops and cattle grazing. Forest industries provide large quantities of products for expanding local markets as well as for northern and midwestern markets and for export. Industries of less importance include mining of limestone, phosphate, clay, and fuller's earth; the manufacture of cigars; and the taking of fish, sponges, oysters, shrimp, and turtles.

For the forest area alone, data from a recent study made by the Division of State and Private Forestry of Region 8 of the United States Forest Service and from the 1935 Census of Agriculture disclose the fact that about 6 percent is publicly owned, 10 percent is in farm woodlands, and 84 percent is in other private ownership. Most of the publicly owned land is in parks and reserves not managed for the sustained-yield production of timber. As for the non-farm privately-owned forest land, a study made of the forest management practices on 22 properties with an aggregate acreage of $1\frac{1}{2}$ million acres showed the following:

Lands left in good growing condition:		
Good cutting practices		9 percent
Poor practice but land left productive		15 percent
Lands not left in good growing condition		76 percent
Total		100 percent

Table 1. - Total land area classified according to land use

Land use	Central Florida		South Florida		Total area	
	<u>Acres</u>	<u>Percent</u>	<u>Acres</u>	<u>Percent</u>	<u>Acres</u>	<u>Percent</u>
Forest:						
Productive	6,170,000	60.8	2,167,800	27.4	8,337,800	46.2
Nonproductive	150,000	1.5	1,352,200	17.1	1,502,200	8.3
Total forest	6,320,000	62.3	3,520,000	44.5	9,840,000	54.5
Cropland and pasture	1,049,500	10.4	404,300	5.1	1,453,800	8.1
Other areas	2,764,900	27.3	3,986,700	50.4	6,751,600	37.4
Total area	10,134,400	100.0	7,911,000	100.0	18,045,400	100.0

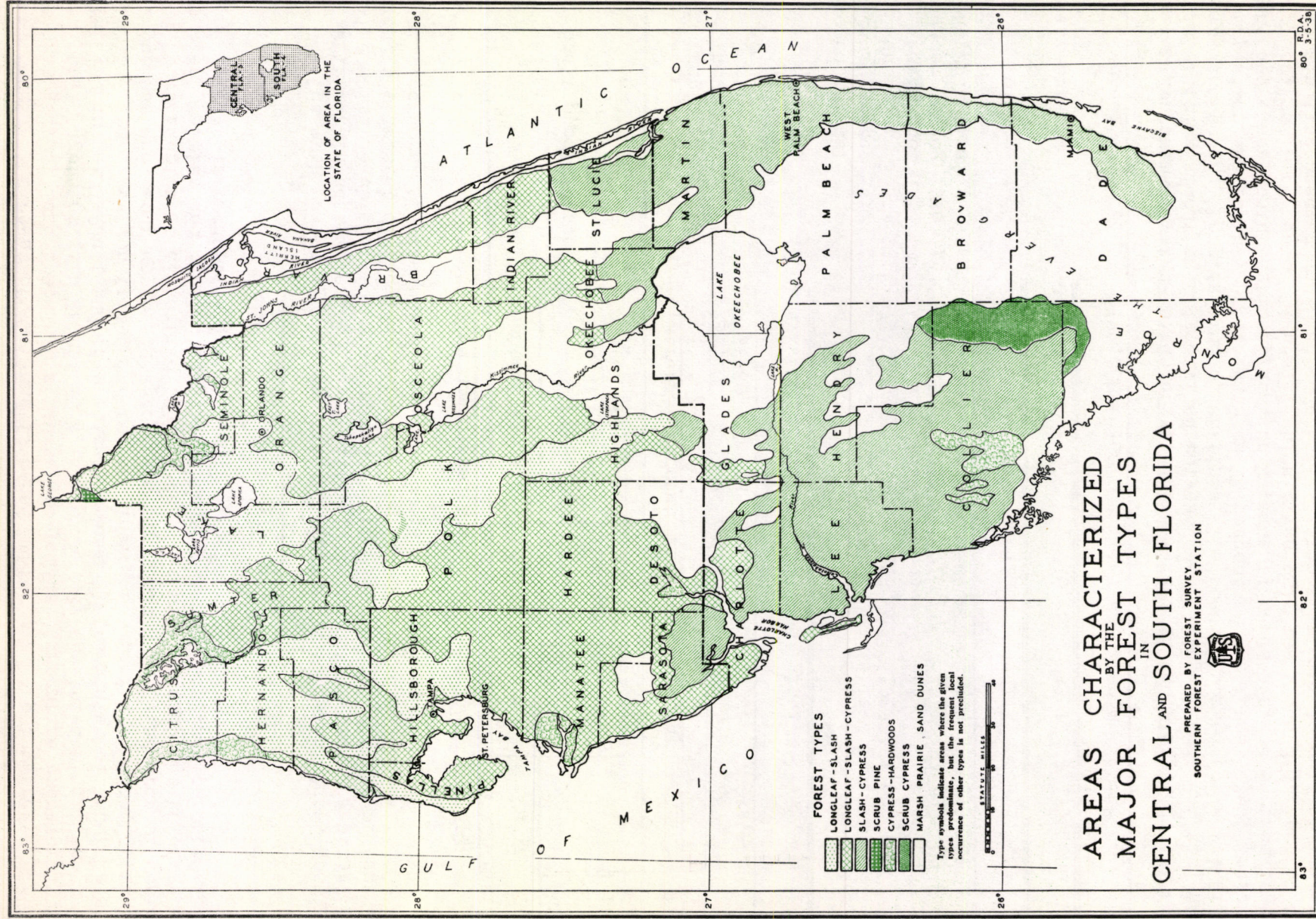


FIGURE 1 - FOREST TYPE MAP.

Only 13 percent of the land is owned by farmers, the remainder being held largely by land speculators, lumber companies, turpentine operators, and public agencies. In August 1934, approximately one-third of all the area was in tax default and theoretically owned by the State, although this may be a temporary condition, for the original landowners are seldom deprived of the use and occupancy of the property. In table 1 the land area of central and south Florida is classified by land use. Notwithstanding the huge areas in open prairies and marshes classified under "other areas", 46 percent of the land surface is productive forest land.

Description of the Forest

Inasmuch as the $1\frac{1}{2}$ million acres of nonproductive forest land, most of which is in south Florida, is of little or no value for timber growing, being suitable chiefly for grazing and for hunting and other types of recreation, the present discussion concerning the forest will deal only with the 8 million acres of productive forest land.

Table 2. - Forest area classified according to forest condition

Forest conditions	Central Florida		South Florida		Entire area	
	Area	Portion of forest area	Area	Portion of forest area	Area	Portion of total forest area
	<u>Acres</u>	<u>Percent</u>	<u>Acres</u>	<u>Percent</u>	<u>Acres</u>	<u>Percent</u>
Old growth						
Uncut	239,100	3.9	248,400	11.5	487,500	5.9
Partly cut	233,300	3.8	79,100	3.6	312,400	3.7
Total	472,400	7.7	327,500	15.1	799,900	9.6
Second growth:						
Sawlog size:						
Uncut	731,300	11.9	278,000	12.8	1,009,300	12.1
Partly cut	195,400	3.2	33,500	1.5	228,900	2.7
Under sawlog size	1,690,000	27.3	716,500	33.1	2,406,500	28.9
Reproduction	357,800	5.8	95,800	4.4	453,600	5.4
Total	2,974,500	48.2	1,123,800	51.8	4,098,300	49.1
Clear-cut	2,723,100	44.1	716,500	33.1	3,439,600	41.3
All conditions	6,170,000	100.0	2,167,800	100.0	8,337,800	100.0

Approximately two-thirds of this forest lies in the flatwoods, the remainder being almost equally divided between the rolling uplands and the swamps, bays, and ponds. Longleaf and slash pines, the species worked for naval stores (turpentine and rosin), predominate on 79 percent of the forest area; loblolly pine and other nonturpentine pines, on 2 percent; hardwoods, on 9 percent; and cypress, on 10 percent. Figure 1, which gives only the broad distribution of predominating species and species-groups, does not attempt to outline the non-forest land or the intermingled small areas of different types. The longleaf

and slash pine types are found in all topographic situations; in central Florida, longleaf pine predominates, while in south Florida slash pine is the more common species. The former area, which includes most of the loblolly and other pines usually associated with the rolling uplands, also includes most of the hardwoods (such as red and black gums and red and white oaks), which are usually found in the swamps, bays, and ponds. Cypress also prefers these latter situations, but occupies a larger area in south than in central Florida.

Less than 10 percent of the forest area is classed as old growth, with the characteristics of large, old, high-quality trees (table 2 and fig. 2). Much of the old growth is partly cut, i.e., 10 percent or more of the saw-timber volume has been removed, but at least 1,000 board feet per acre of hardwood and cypress or 600 board feet of pine and mixed pine-hardwoods, have been left. "Sawlog-size" hardwoods are 13.0 inches and over d.b.h. (diameter at breast height, or $4\frac{1}{2}$ feet above the ground) and sawlog-size pine and cypress trees are 9.0 inches or larger d.b.h. A few of the tracts average more than 10,000 board feet per acre, as measured by the International $\frac{1}{4}$ -inch rule, which in general is equivalent to green lumber tally, but the averages for the uncut old growth are about 4,200 board feet in central Florida and 3,200 board feet in south Florida, and for the partly cut old growth, 2,400 and 1,600 board feet, respectively. Cypress and hardwood stands are usually heavier than the average, while the pine stands are lighter.

FOREST TYPE - GROUPS

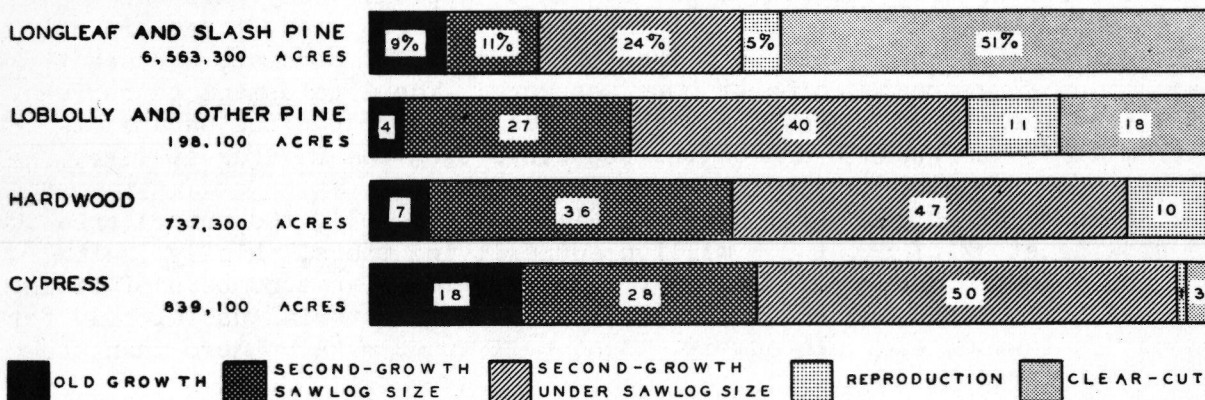


FIGURE 2 - CLASSIFICATION OF THE AREA IN EACH FOREST TYPE-GROUP ACCORDING TO FOREST CONDITION.

From an area standpoint, the most important forest condition is the second growth, which occupies almost half the forest area. Second-growth stands having a minimum of 600 board feet per acre if uncut, or 400 board feet if partly cut, in trees that have reached sawlog size, occupy only 15 percent of the total forest area. The average of the uncut, second-growth stands is about 2,000 board feet (green lumber tally) per acre in central Florida, and 1,600 in south Florida. Under-sawlog-size stands made up chiefly of pole or sapling-size trees are found on 29 percent of the forest area; and although average saw-timber volumes run between 100 and 200 board feet per acre, usually

in remnant trees, they contain an average of about 2 cords per acre. Reproduction areas, where the most important cover is trees in the seedling stage less than 1 inch d.b.h, occupy 5 percent of the forest area and are found mostly in central Florida. All reproduction areas have been naturally reforested with at least 80 seedlings per acre, but owing principally to the frequency of fire, both the number and distribution of the seedlings are generally poor, as indicated by the following classification:

<u>General stocking classification</u>	<u>Central Florida</u>	<u>South Florida</u>
	- - - Percent - - -	
Satisfactory (more than 900 well-distributed seedlings per acre)	4	11
Fair (170 to 900 well-distributed seedlings, or 300 or more seedlings with fair distribution)	41	33
Poor (80 or more poorly distributed seedlings)	55	56
Total	100	100

Almost barren of both trees and seedlings, 41 percent of the forest land is "clear-cut," stripped of trees as the result of clear-cutting and fire. Central and south Florida have the unfortunate distinction of containing by far the highest proportion of clear-cut area found in any section of the South. For all pine types combined, approximately half the area is clear-cut. In about 27 percent of the pine clear-cut area, there are no seed trees; on 18 percent, one seed tree per acre; on 14 percent, two seed trees; and on 41 percent, three or more per acre. The development of reproduction from these seed trees, however, depends largely upon the escape of seed from birds and rodents and of the seedlings from the ravages of fire.

As shown graphically in the stand diagrams (fig. 3), the entire area has a growing stock of about 606 million sound living trees, chiefly in the 2-inch and 4-inch classes ^{1/}. There are, in addition, large numbers of living cull trees, both sound and rotten, which contain some material useful only for pulpwood, fuel wood, etc. In number, these cull trees make up more than one-third of the forest stand.

The site quality, or productivity of the forest areas, based upon the average height (in feet) of dominant trees at the age of 50 years, is generally poorer than that found elsewhere in Florida or in the southern pine region as a whole. Of the sites dominated by pines, only 2 percent are good, with an index of 80 feet or better; 44 percent are medium, with an index of 60 to 70; while 54 percent are poor, with an index of 50 feet or less. The line separating the two units discussed herein represents in a general way the southern limit of profitable forestry possibilities. Nevertheless there may be a few areas in south Florida suitable for profitable management; while in central Florida there are undoubtedly large tracts of forest land where the sites are so poor that the cost of growing timber would be prohibitive.

^{1/} The 2-inch class includes all trees 1.0 to 2.9 inches (inclusive) d.b.h., the 4-inch class, those 3.0 to 4.9 inches d.b.h., and so on.

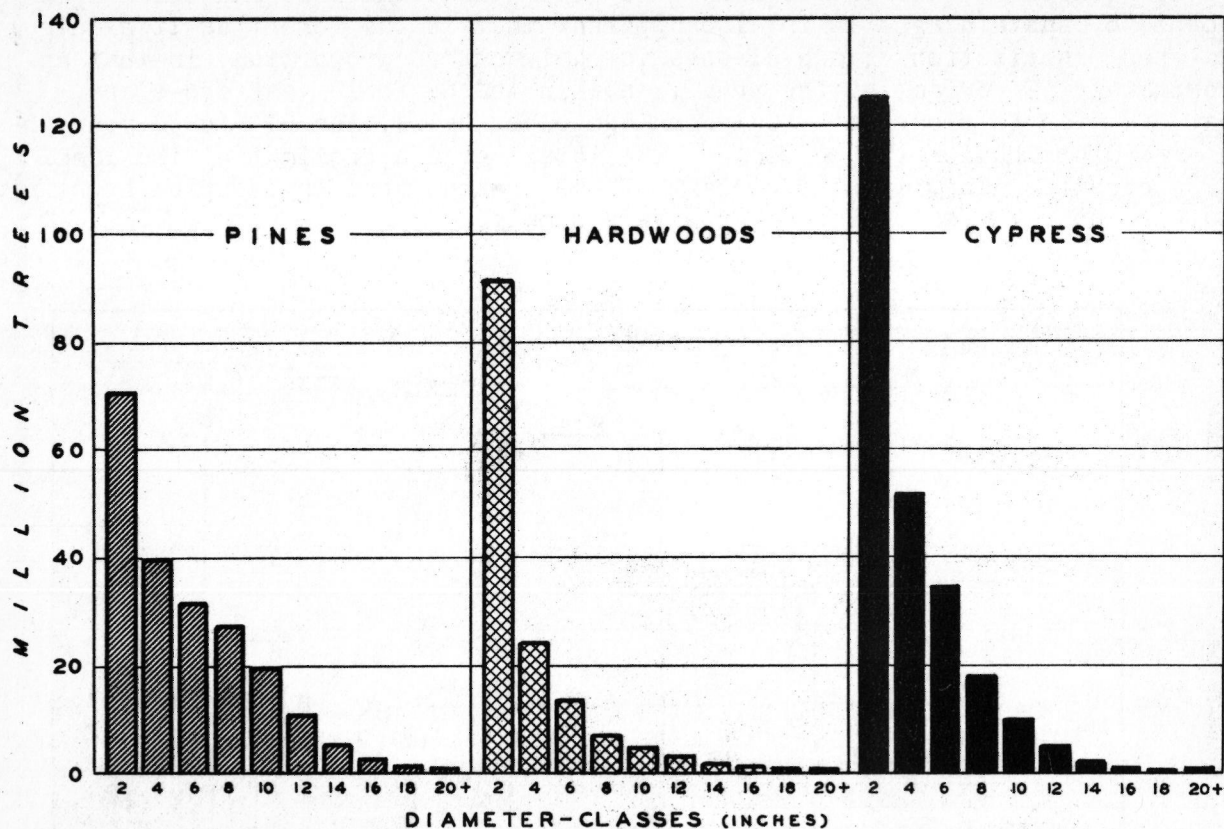


FIGURE 3—STAND DIAGRAMS.

A graphic picture of the condition of the longleaf and slash pine forests of central Florida is shown (fig. 4) by comparing the age-class and volume distribution of the present forest (shown by solid line) with those attainable under management (shown by dotted line). The managed forest is based on an assumed rotation of 70 years for the production of naval stores, lumber, poles, cross ties, and pulpwood as integrated crops. The yields are shown in gross volume, i.e., nothing has been deducted for woods or mill cull, but as a partial equalizing factor the volumes in butts of turpentine trees are excluded. That the estimated yields of the managed forest are attainable within a reasonable length of time, over large areas, through fire protection, planting, stand-improvement cutting, conservative turpentine, and selective logging is indicated by the yields actually found in the best 10 percent of the uncut field plots, adjusted to conform to the weighted-average site. In the managed forest, the area is divided into 7 equal parts—one for each 10-year age-class. The average gross volume per acre in cubic feet (i.b.) of the growing-stock trees increases with fair rapidity until the 31- to 40-year class is reached, after which the increase in volume per acre per decade is small, suggesting that a rotation of 40 years for naval stores and pulpwood may be more profitable than the longer 70-year rotation for saw timber and similar products.

Comparing the average volumes per acre, age-class for age-class, of the existing forest with those of the managed forest discloses the fact that they are far under the possibilities of the sites involved. It will take years of careful cutting practices and good protection from fire to build up the present, thin, open stands of pine with a high proportion of cull trees to thrifty

stands with the number of trees and the volume that the soil and climate is capable of sustaining. It is also apparent that in the forest as it exists the area distribution of age-classes is badly out of proportion, in that approximately 59 percent of the area is now in the 0- to 10-year age-class, most of which is clear-cut. Only one age-class, viz., the 21- to 30-year, has an area distribution (10 percent of the total) even approximating the ideal 14.3 percent. Also, about 9 percent of the present area is occupied by stands that are over 70 years old and grow very slowly.

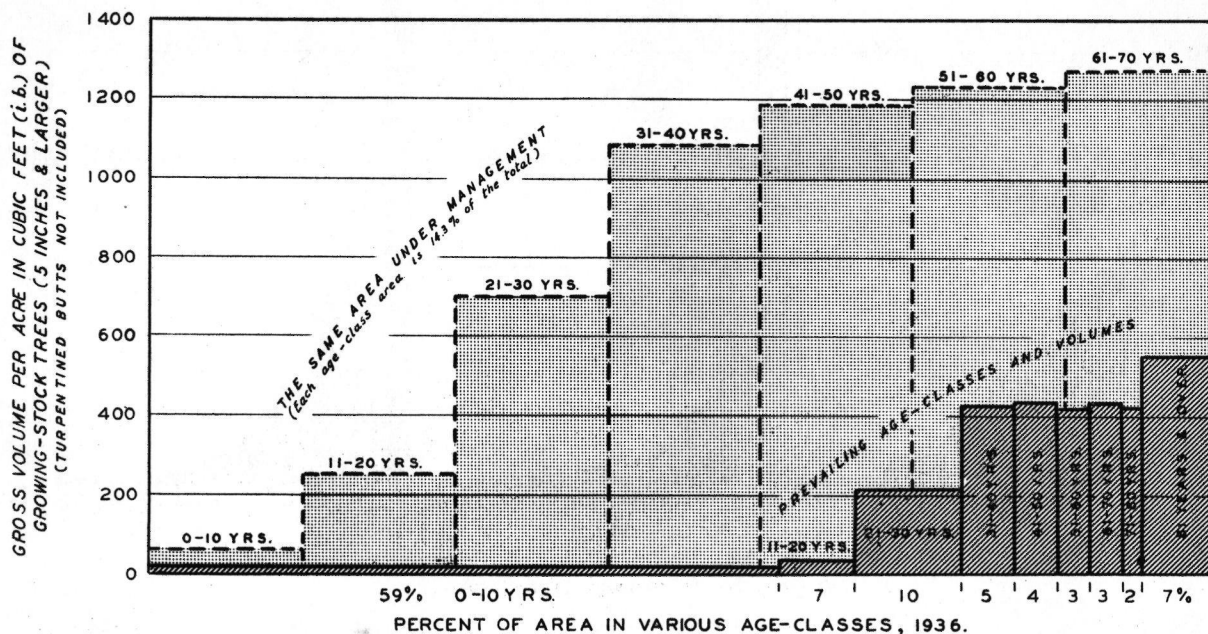
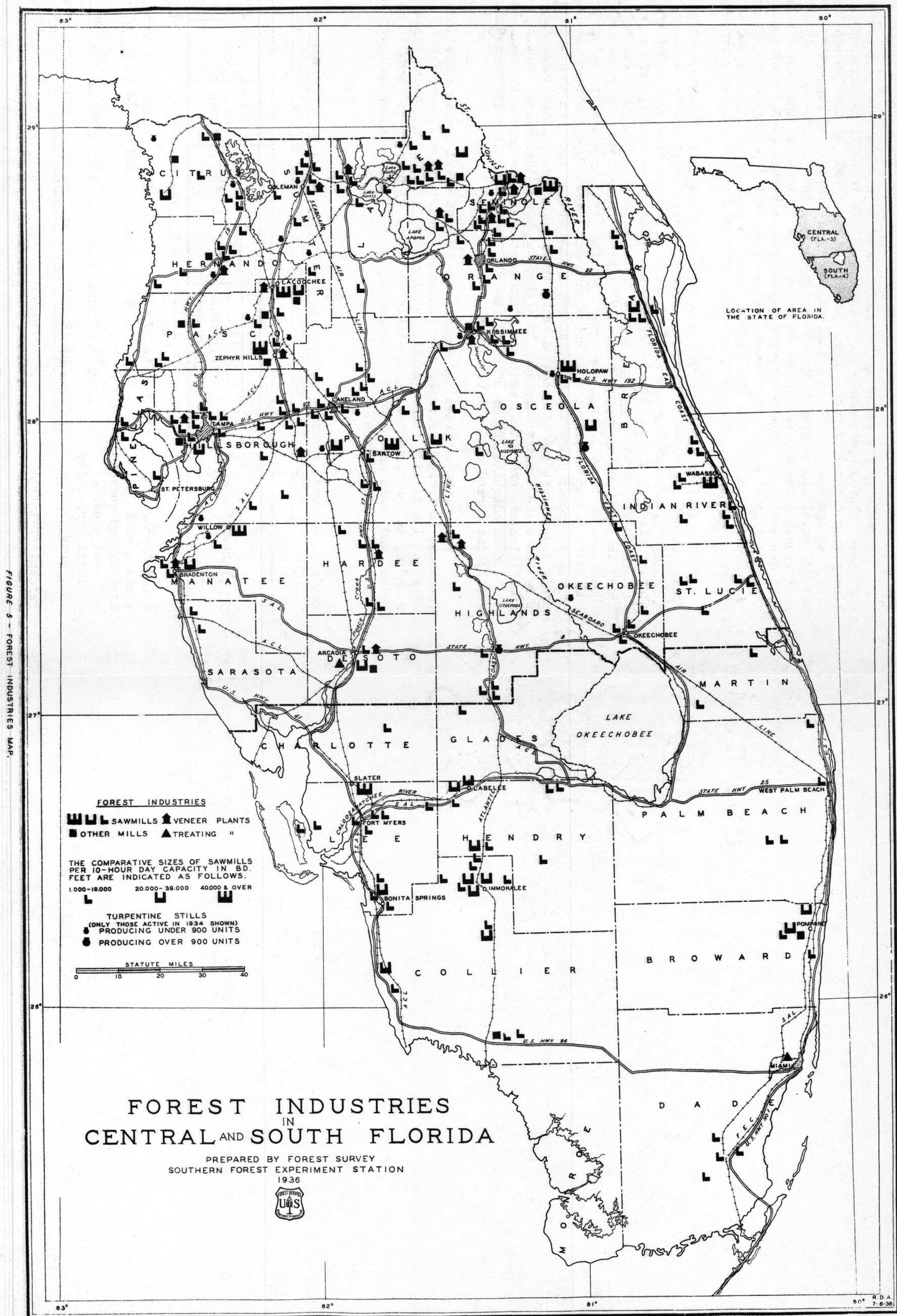


FIGURE 4 - PREVAILING AGE-CLASS AND VOLUME DISTRIBUTION COMPARED WITH THOSE ON THE SAME AREA UNDER MANAGEMENT (BASED ON LONGLEAF-SLASH PINE TYPE AREA OF 5,001,800 ACRES).

Gum Naval Stores Industry and Resources

This area furnishes only 3 percent of the annual production of gum naval stores in the United States. During the 1934-35 season (year beginning March 1), there were 23 gum naval stores distillation plants in central Florida and none in south Florida (map, fig. 5). The gum yields of trees in south Florida are considered too small to support commercial operations. At the beginning of the 1936-37 season there were 385 crops of cups (10,000 cups to a crop) in operation in central Florida, mostly in second-growth timber, and the season's production amounted to about 14,550 units ^{2/}. The average yield for crops worked through the season was about 42 units, which was also about the average for the entire naval stores belt. According to prices received at the Savannah naval stores market, the production was worth about \$900,000.

^{2/} A unit is one 50-gallon barrel of turpentine together with 3-1/3 500-pound (gross weight) barrels of rosin.



Since very few areas in south Florida offer opportunities for commercial naval stores operations, the following discussion will be concerned entirely with central Florida. Here the tracts which make up the "turpentine area," an aggregate of about 5 million acres, are capable of supporting commercial naval stores operations, although many of them include intermingled nonturpentine forests and clear-cut areas. Tracts that are inaccessible or that are small and isolated (roughly estimated at about one-fifth of the turpentine area) may not be worked. Also, some of the poorer stands, generally found south of Tampa and Wabasso, have low productive capacity and may not be worked profitably except in times of high prices for naval stores.

The various tracts of the turpentine area are classified according to their history as follows: "round," "working," "resting," and "worked-out." Round areas, aggregating 4,085,000 acres, have not yet been worked and are characterized by unturpented longleaf and slash pines ranging from reproduction to old growth. Working areas, with a total of 157,000 acres, have trees that were being cupped in the 1935-36 season; approximately half of these have at least 12 cups per acre. Resting areas have stands that are not being cupped at present but which have sufficient opportunities for another commercial operation by working a second set of faces on the worked trees and a first set of faces on round trees that have reached turpentine size since the earlier cupping. In worked-out areas the present working possibilities are exhausted, and operations must await the growth to workable size of an adequate number of round trees. The resting area includes 312,000 acres; the worked out, 631,000 acres.

The supply of trees for cupping for present naval stores operations and for those in prospect for several decades in the future must come from a total of about 139 million round, working, and resting longleaf and slash pines now standing in the turpentine area (table 3). Over 93 percent of these trees are round, and there are about 8 times as many round trees 9 inches and over as there are working trees.

Table 3. - Round, working, resting, and worked-out longleaf and slash pine trees on turpentine areas of varying history during the 1935-36 season

Turpentine area	Round trees		Working trees	Resting trees	Worked-out trees	Total	Proportion of total
	1.0-8.9 in. d.b.h.	9.0 in. d.b.h. & over					
----- M trees -----			Percent				
Round-timber area	92,252	17,669	-	1,481	191	111,593	79.2
Working area	5,804	228	2,434	119	112	8,697	6.2
Resting and worked-out areas	12,703	1,240	-	5,391	1,247	20,581	14.6
Total turpentine area	110,759	19,137	2,434	6,991	1,550	140,871	100.0
Percent of total	78.6	13.6	1.7	5.0	1.1	100.0	

An analysis of the present naval stores stand condition of the gross turpentine area is given in figure 6, bar A, and for its component areas in the other bars. Of the total turpentine area, 24 percent, or 1,233,000 acres, has "well-developed" stands. These stands average 19 future faces per acre on round, resting, or working trees 9.0 inches or larger (no areas with less than 8 faces are included). Approximately 454,000 acres of the total turpentine area has "advanced-sapling" stands with a sufficient number of round trees now in the 8-inch diameter-class to become well developed within the next 8 to 15 years. An additional 585,000 acres is in "young sapling" stands, predominantly 2-, 4-, and 6-inch trees that will require 15 to 20 years to become well developed; while 2,778,000 acres is in reproduction and clear-cut areas requiring over 20 years to reach turpentine size. Much of this class of land is so bare of tree growth that artificial reforestation will be required to restore it to useful condition. About 135,000 acres is in intermingled non-turpentine areas.

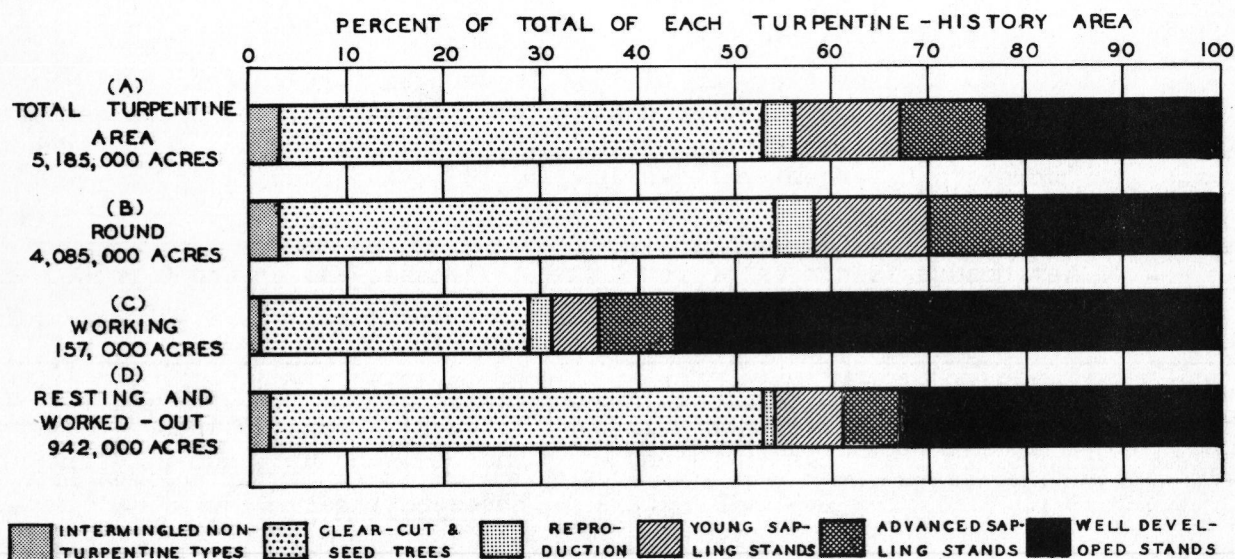


FIGURE 6- CONDITION OF THE TURPENTINE AREA.

Future outlook for gum naval stores timber

To maintain their turpentine orchards during the period 1929-1935 the naval stores operators of central Florida drew upon the reserve supply of round and resting trees to the extent of about 500,000 new faces each season. It is interesting to analyze the inventory of potential faces in well-developed stands to see if this annual requirement can be met in the years to come. The basic assumptions are that all the potential faces on round, working, and resting trees in the well-developed stands will be utilized and that a 9-inch minimum diameter limit will be followed.

For the 8-year working cycle (6 years working, 2 resting) in the period 1936 to 1943, it appears that there are sufficient future faces to allow the placing of about 3 million new faces annually, or six times the requirements of the recent past. If the old practice of cupping at least one-third of the

trees in the 8-inch class should prevail, the annual income would be increased to $3\frac{1}{2}$ million faces.

In the second 8-year cycle, 1944-1951, the inventory of potential faces on round, working, and resting timber would still be sufficient to allow the placing of about 3 million new faces on the 9-inch cupping limitation and $3\frac{1}{2}$ million on the old cupping basis. In the third cycle beginning 1952, the annual income may decrease to only $2\frac{1}{2}$ million new faces, 9 inches and up.

This consideration of the future supply is based upon assumptions that may not hold true. If the pulp industry should locate on, or draw heavily from, the pine forests of central Florida, the number of both round and resting trees might be materially reduced or at least removed from availability for naval stores use. Also, there is an insistent present demand for building material and wood for fruit and vegetable containers that may grow to such proportions as to reduce the supply for naval stores use. As shown in table 4, the number of round trees cut for wood products in 1936 was almost as great as the number used for turpentine.

In table 4, the inventory as of 1934 is brought forward through 1935 and 1936 by the application of subsequent growth, mortality, and drain estimate figures. This approximation discloses that the supply of round trees 9 inches and larger increased 6 percent between Jan. 1, 1934, and Dec. 31, 1936.

Table 4. - Net change in number of round trees 7 inches and up and 9 inches and up between Jan. 1, 1934, and Dec. 31, 1936, in the turpentine area

Item	1934		1935		1936	
	7 inches and up	9 inches and up	7 inches and up	9 inches and up	7 inches and up	9 inches and up
----- Thousand trees -----						
Round trees as of Jan. 1	36,671	18,356	37,170	18,954	37,165	19,137
Increase due to recruits from small sizes	2,179	1,792	2,179	1,792	2,179	1,792
Decrease due to mortality	771	399	772	402	774	408
Net increase	1,408	1,393	1,407	1,390	1,405	1,384
Trees turpentine	293	243	741	615	651	540
Trees cut for products	616	552	671	592	571	509
Total industrial drain	909	795	1,412	1,207	1,222	1,049
Net change during year	499	598	-5	183	183	335
Round trees Dec. 31	37,170	18,954	37,165	19,137	37,348	19,472
Percent of number on Jan. 1, 1934	101.4	103.3	101.3	104.3	101.8	106.1

Wood Naval Stores Resources

Although there are no wood-distillation plants in this area — the closest is at Gainesville, Florida, about 45 miles north — the large resource of stumpwood is worthy of consideration. There are over 1 3/4 million acres with usable, matured longleaf and slash pine stumps, and in sufficient quantities (6 or more stumps per acre) to warrant commercial extraction. Practically all of this acreage is in central Florida, and slightly more than three-fourths of it is in the flatwoods, where the heaviest per-acre tonnage of stumps usually is found and extraction by mechanical stump pullers is most practicable (table 5). Approximately 70 percent of the present merchantable stumpland is in the clear-cut forest condition.

Table 5. - Stand of merchantable stumps (blasting basis)

Stumps per acre	Area	Topographic situation		Total	Proportion of total
		Flatwoods ^{1/}	Rolling uplands		
	Acres		Thousand tons		Percent
6 to 13	709,100	1,097	321	1,418	19.1
14 to 25	589,000	1,944	412	2,356	31.7
26 or more	487,900	3,127	532	3,659	49.2
Total	^{2/} 1,786,000	6,168	1,265	^{2/} 7,433	100.0
Percent of total		83.0	17.0	100.0	

^{1/} Includes 2,500 acres and 7 thousand tons in swamps, ponds, etc.

^{2/} In addition, there are 674,600 acres and 270 thousand tons in areas having 5 stumps or less per acre.

If the common practice of blasting is used in extraction, there is an estimated supply of almost 7½ million tons ^{3/} of stumps in areas having 6 or more stumps per acre. In addition, there is a potential supply of almost 4 million tons of stumps (6 or more stumps per acre) that are unseasoned or are in stands with trees so dense that present extraction would probably cause more damage to the small trees than the stumps are worth; in the future much of this may be usable.

With wood-distillation plants of the steam-solvent type elsewhere in the naval stores belt producing about 6 gallons of turpentine and 350 pounds of rosin per ton of stumps, it is evident, so far as the supply of wood is concerned, that central Florida could support a wood naval stores industry of considerable size. During the last decade the naval stores industry has suffered through chronic overproduction; thus large scale utilization of this wood supply may have to await more favorable times.

^{3/} If stump pullers are used, the estimated supply is increased about two-thirds.

Inventory Estimates of Volume

Saw timber

Only trees having the following requirements are included in the saw-timber inventory: living trees of commercial species at least 50 percent sound, or with a sound butt log at least 12 feet long; pines and cypress 9.0 inches and larger d.b.h., and hardwoods at least 13.0 inches. Although the top-diameter limit varies with the quality of the stem, no pine or cypress logs less than 5½ inches in diameter inside bark at the small end and no hardwood logs less than 8½ inches are included; the top-diameters actually used averaged larger than these minima. Usable portions of turpentine butts are included in the estimates. All figures are net, as necessary deductions have been made for woods cull because of rot, fire scar, crook, limbiness, etc., as well as for loss in manufacture due to sweep and hidden defects. Typical cull factors applied to the gross volume are:

	Percent
Longleaf and slash pines, old growth	10
Longleaf and slash pines, second growth	7
Loblolly and other pines, all conditions	10
Cypress, old growth	35
Cypress, second growth	25
White oak, all conditions	25
Red gum, all conditions	8

Table 6. - Net board-foot volume expressed in Doyle scale and in green lumber tally, based on International ¼-inch rule

Species	Central Florida		South Florida		Entire area	
	Doyle scale	Green lumber tally	Doyle scale	Green lumber tally	Doyle scale	Green lumber tally
----- Thousand board feet -----						
Pines:						
Longleaf	767,800	1,442,300	34,900	58,700	802,700	1,501,000
Slash	514,100	951,300	499,700	882,700	1,013,800	1,834,000
Loblolly and other	103,200	173,200	-	-	103,200	173,200
Total pines	1,385,100	2,566,800	534,600	941,400	1,919,700	3,508,200
Hardwoods:						
Red gum	97,500	137,300	-	-	97,500	137,300
Black gum	119,900	170,300	2,000	3,200	121,900	173,500
Red oaks	51,400	69,400	500	700	51,900	70,100
White oaks	54,800	66,300	-	-	54,800	66,300
Other hardwoods	133,200	199,600	5,700	8,300	138,900	207,900
Total hardwoods	456,800	642,900	8,200	12,200	465,000	655,100
Cypress	322,200	613,200	368,100	618,800	690,300	1,232,000
Total all species	2,164,100	3,822,900	910,900	1,572,400	3,075,000	5,395,300

The total volume as of 1936 was 3 billion board feet measured by the Doyle rule, which is used locally but which results in an underestimate of the volume of small trees, or more than 5 billion board feet using the International $\frac{1}{4}$ -inch rule, which closely approximates green lumber tally (table 6). The usual impression that this is primarily a pine area is verified by the fact that pine makes up almost two-thirds of the total saw-timber volume, using the figures of the green lumber tally as a basis. There is considerably more volume in cypress than in all the hardwoods combined, although black and red gums and red and white oaks are relatively important. Other hardwoods commonly found are bay, maple, ash, elm, and hickory. Central Florida includes 73 percent of all the pine saw-timber volume in the two units, 98 percent of the hardwood, and 50 percent of the cypress.

Old-growth stands include 46 percent of all the saw-timber volume (table 7). With an extension of roads and railroads and an increase in the price of old-growth stumpage in the future, many of the remaining old-growth uncut stands, such as the sizable block of old-growth cypress in the Big Cypress Swamp, probably will be logged. The second-growth stands, which are increasing in importance, already contain over half the saw-timber volume. Especially in south Florida, many stands running only 400 board feet per acre, which is the minimum used for the Survey's classification of saw-timber stands, are logged with tractors, trucks, and other mobile equipment.

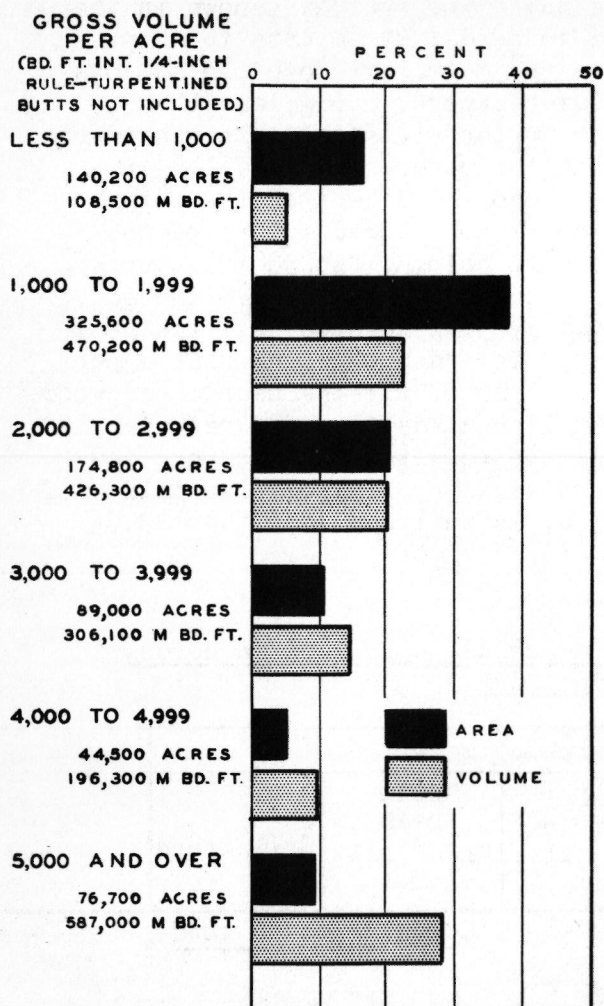
It is noteworthy that trees generally considered small by lumber manufacturers (i.e., pine and cypress 9.0 to 12.9 inches d.b.h. and hardwoods 13.0 to 18.9 inches) include 51 percent of the pine saw-timber volume, 63 percent of the hardwood, and 45 percent of the cypress (table 7).

As a general rule, the saw-timber stands in this area have always been unusually "light" (i.e., they have low volumes per acre), as indicated by the proportional area and volume per acre of various stands in the longleaf and slash pine types (fig. 7). The proportions shown are based upon gross volumes; no deductions have been made for cull, but as a partially equalizing factor, the saw-timber volumes in turpentine butts have been excluded. While a slight error is possible in the first class (under 1,000 board feet) because the data were taken on quarter-acre plots, the combined data in the first two classes are significant. In central Florida, stands having less than 2,000 board feet per acre include 55 percent of the area in longleaf and slash pine sawlog-size conditions, but only 28 percent of the total volume (fig. 7, A). For south Florida, stands having less than 2,000 board feet make up 60 percent of the saw-timber area and less than 36 percent of the volume (fig. 7, B).

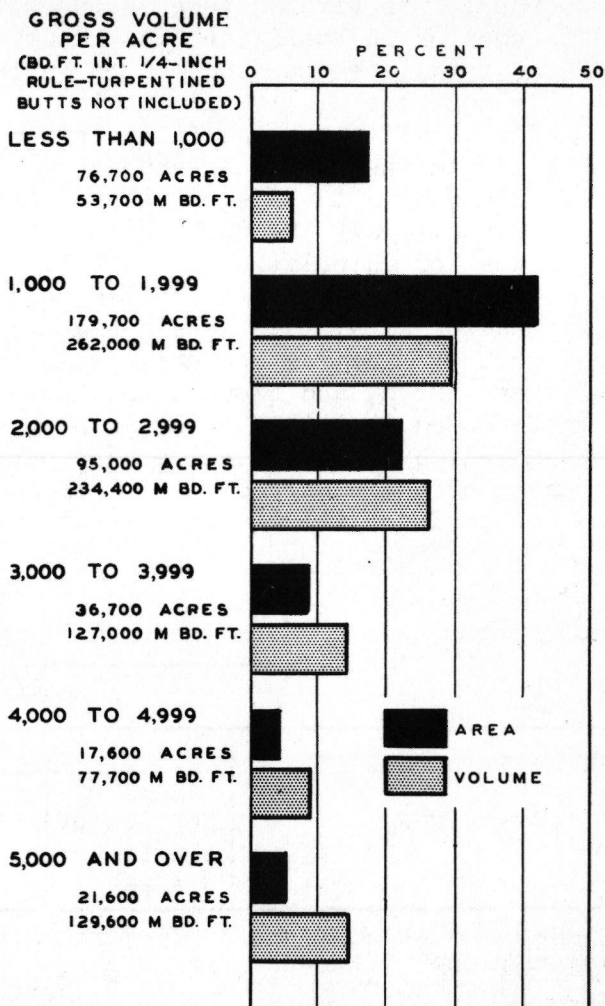
Table 7. - Diameter distribution of net board-foot volume (Int. $\frac{1}{4}$ -inch rule) in the various forest conditions

Species-groups and diameter-groups in inches	Old growth		Second growth		Total	Percent of total
	Uncut	Partly cut	Sawlog size	Under saw- log size ^{1/}		
- - - - - <u>Thousand board feet</u> - - - - -						
Pines:						
10 - 12	239,600	126,400	948,600	480,500	1,795,100	33.3
14 - 16	440,300	146,000	397,700	96,100	1,080,100	20.0
18 - 20	263,700	88,000	82,700	13,900	448,300	8.3
22 & over	132,200	31,000	20,500	1,000	184,700	3.4
Total pines	1,075,800	391,400	1,449,500	591,500	3,508,200	65.0
Hardwoods:						
14 - 18	74,200	81,500	229,600	26,000	411,300	7.6
20 - 28	65,200	55,000	86,300	2,200	208,700	3.9
30 & over	20,400	7,100	7,600	-	35,100	0.7
Total hardwoods	159,800	143,600	323,500	28,200	655,100	12.2
Cypress:						
10 - 12	106,400	57,800	347,600	45,900	557,700	10.3
14 - 16	137,700	41,900	105,900	4,300	289,800	5.4
18 - 20	108,600	22,200	19,000	1,300	151,100	2.8
22 & over	200,200	30,400	2,800	-	233,400	4.3
Total cypress	552,900	152,300	475,300	51,500	1,232,000	22.8
Total all species	1,788,500	687,300	2,248,300	671,200	5,395,300	100.0
Total all species:						
Central Florida	993,400	563,300	1,761,600	504,600	3,822,900	
Percent of total	26.0	14.7	46.1	13.2	100.0	70.9
South Florida	795,100	124,000	486,700	166,600	1,572,400	
Percent of total	50.5	7.9	31.0	10.6	100.0	29.1

^{1/} Includes a small amount in the reproduction and clear-cut conditions.



A-CENTRAL FLORIDA



B-SOUTH FLORIDA

FIGURE 7 - PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS IN THE TURPENTINE PINE TYPES, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

Cordwood

The entire usable volume of wood in all live trees 5.0 inches and larger, saw timber included, is over 33 million standard cords (4 x 4 x 8 feet), including bark. Approximately three-fourths of this volume is in central Florida and one-fourth is in south Florida. Of interest to the rapidly growing pulp and paper industry of the South is the fact that there are almost 29 million cords of wood suitable for pulping, of which 15 million are pine, 5 million are soft-textured hardwoods, such as red gum, black gum, magnolia, and bay, and 9 million are cypress, a possible future source of pulp. All the volumes mentioned herein are net, necessary deductions having been made for unusable volumes; these range from 20 to 80 percent for the cull trees, from 2 to 10 percent for the sound pines and hardwoods, and from 10 to 25 percent for the sound cypress. Much of this loss can be attributed either directly or indirectly to frequent burning of the woods.

In table 8, sound cordwood volume is shown by source of material and species-group. The first column includes the saw-timber volume (shown in the preceding section in board feet) as expressed in cords; it amounts to 40 percent of the total. The second column includes the material above the sawlogs to a usable top, the minimum allowable top-diameter never being less than 4 inches and generally greater; in the pines, the upper stems only are considered usable, while in the hardwoods and cypress both the upper stems and larger limbs are included. These sources of material have 11 percent of the total cordwood volume. Only the upper stems of pine are considered a part of the growing stock for calculating increment. The next column, "sound trees under sawlog size," includes all the usable volume in sound trees from 5.0 inches d.b.h. to sawlog size; this includes approximately 30 percent of all the cordwood volume. The last column, "cull trees," includes only the usable portion of these trees, and amounts to about 19 percent of all the usable cordwood. It is to be noted that this area has over 6 million cords of sound material in cull trees (which are not considered a part of the forest growing stock) and 500 thousand cords in worked-out turpentine trees. Approximately two-thirds of all the net cordwood volume, cull trees omitted, is in trees less than 13.0 inches d.b.h. (fig.8).

Table 8. - Net volume of all sound material, expressed in cords,
bark included

Species-group	Source of material				Total
	Sawlog portion of saw-timber trees	Upper stems of saw-timber trees	Sound trees under saw- log size	Cull trees	
<hr/>					
----- <u>Cords of rough wood</u> -----					
Pulping species:					
Pines:					
Longleaf and slash:					
Round	6,194,300	1,069,800	3,635,700	298,600	11,198,400
Turpentine	1,710,800	436,700	388,000	79,200	2,614,700
Loblolly and other pines	405,600	57,500	160,700	76,100	699,900
Total pines	8,310,700	1,564,000	4,184,400	453,900	14,513,000
Hardwoods (pulping) ^{1/}	1,116,500	572,400	2,121,200	1,562,300	5,372,400
Cypress	3,406,000	1,130,300	2,982,400	1,284,900	8,803,600
Total pulping species	12,833,200	3,266,700	9,288,000	3,301,100	28,689,000
Nonpulping hardwoods ^{2/}	575,300	318,600	810,100	2,922,200	4,626,200
Total all species	13,408,500	3,585,300	10,098,100	6,223,300	33,315,200
<hr/>					
Total all species:					
Central Florida	9,505,600	2,488,200	7,684,900	4,770,000	24,448,700
South Florida	3,902,900	1,097,100	2,413,200	1,453,300	8,866,500

^{1/} Pulping hardwoods include red, black, and tupelo gums; magnolia; bay; maple; etc.

^{2/} Nonpulping hardwoods include scrub, white, and red oaks; ash; hickory; elm; sycamore; etc. All scrub oaks are classed as cull trees.

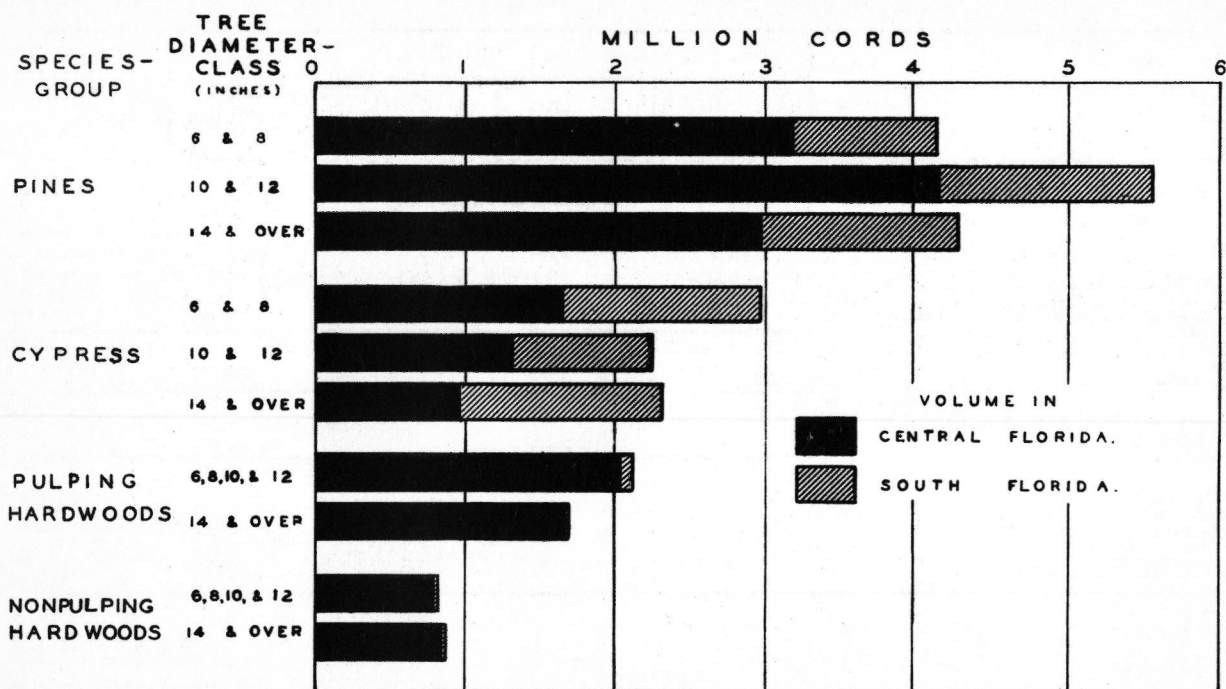


FIGURE 8 - CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES BY SIZE - CLASSES, SOUND TREES ONLY (CULLS OMITTED).

Poles and piles

Although trees containing poles and piles are already included in the saw-timber and cordwood volumes, owing to their importance they are shown in a special inventory. At a conservative estimate there are in the area about 15½ million trees that will make poles or piles (table 9); most of these are in central Florida. The great majority are round, but there are almost 2 million sticks in turpentine trees, where deduction in usable length was made for a part of the turpentine butts. That over three-fourths of the sticks are 20 and 25 feet long and that only a small number are 40 feet and over are important facts in considering the use of this resource. The table, however, does not show the significant item that 35 percent of the sticks are in trees 7 to 8.9 inches d.b.h. outside bark; 38 percent in trees 9 to 10.9 inches; and only 27 percent are in larger trees.

Table 9. - Pole and pile resources

Species-group	Length of poles and piles			Total	Percent of total
	20 and 25 feet	30 and 35 feet	40 feet and over		
	- - - - - <u>Thousand pieces</u> - - - - -				
Round longleaf and slash pines	10,579	2,490	390	13,459	86.4
Turpentine pines	1,399	451	20	1,870	12.0
Loblolly and other pines	217	40	-	257	1.6
Total	12,195	2,981	410	15,586	100.0
Percent of total	78.3	19.1	2.6	100.0	
Total all species:					
Central Florida	9,728	2,374	334	12,436	79.8
South Florida	2,467	607	76	3,150	20.2

Increment

Increment is defined as the difference between the growing-stock volume at the beginning and the end of any year, before the commodity drain for the same year is deducted. The saw-timber increment on the entire area, which during 1936 amounted to almost 183 million board feet (table 10) before deducting the commodity drain for the year, is calculated by subtracting mortality (83 million board feet) from total growth (266 million board feet). Total growth, which is the growth upon the growing stock that remains standing throughout the year plus the growth on trees cut during the year, is adjusted for degrading of butts due to turpentine. Neither the volume in cull trees nor that in the upper stems and limbs of hardwoods and cypress is considered part of the growing stock.

Approximately four-fifths of the total increment occurs in central Florida and one-fifth in south Florida. For the entire area under discussion, the net increment in board feet in 1936 by species-groups was as follows: longleaf and slash pines, 126 million; loblolly and other pines, 10 million; hardwoods, 22 million; and cypress, 25 million.

For all growing-stock material, including trees to a minimum of 5.0 inches d.b.h. as well as those of saw-timber size, the net increment, before making deductions for commodity drain, in 1936 amounted to 622,000 cords of rough wood with bark, or 44 million cubic feet of wood without bark (table 10).

It is roughly estimated that turpentine reduced the increment of the longleaf and slash pines in 1936 almost 40 million board feet. Sixty percent of this loss was made up of decreased growth; 20 percent was caused by increased mortality; and 20 percent was due to the degrading of wood in turpentine butts.

In 1936 the average net increment per acre, assuming that the stands had not been influenced by cutting, for all the productive forest area, including that classed as clear-cut, was only 23 board feet of saw-timber material, or 0.08 cord of rough wood for all growing-stock material; it was greater in central than in south Florida. For the area as a whole, the net increment per acre (table 10) generally compares very unfavorably with that of managed forests or with that of unmanaged forests in the remainder of the South.

Table 10. - Net increment, 1936

Forest condition	Net regional increment			Average increment per acre (uninfluenced by cutting)		
	M bd.ft. ^{1/}	Cords ^{2/}	M cu.ft. ^{3/}	Bd.ft. ^{1/}	Cords ^{2/}	Cu.ft. ^{3/}
<u>Central Florida:</u>						
Old growth	9,600	54,400	3,720	27	.13	8.9
Second growth:						
Sawlog size	67,600	169,600	12,060	74	.19	13.2
Under sawlog size	55,700	232,400	16,440	33	.14	9.7
Reproduction and clear-cut	11,400	25,300	1,880	4	.01	.6
Total northern part	144,300	481,700	34,100	24	.08	5.6
<u>South Florida:</u>						
Old growth	7,800	14,500	1,090	27	.05	3.9
Second growth:						
Sawlog size	13,500	36,100	2,600	44	.12	8.4
Under sawlog size	14,900	84,200	5,810	21	.12	8.1
Reproduction and clear-cut	2,300	5,100	370	3	.01	.5
Total southern part	38,500	139,900	9,870	18	.07	4.6
Total entire area	182,800	621,600	43,970	23	.08	5.4

^{1/} Green lumber tally.

^{2/} Rough wood, including bark.

^{3/} Inside bark (i.b.).

Wood-Products Industries

Sawmills

Shortly after the beginning of the present century, the lumber industry became active at several points within this area, and with the present excellent shipping facilities, sawmills are found in nearly all parts of these units except in the Everglades, large prairies, and the Big Cypress Swamp (map, fig. 5). Most of the 219 sawmills are small portable mills,

which are efficient in utilizing the generally light stands of timber (table 11). Only 8 large mills (i.e., with a capacity of 40 thousand board feet or more per day) were in operation in 1936 and, as these were dependent upon large blocks of old-growth timber now rapidly disappearing, some of them will cut out in the near future. Over three-fourths of all the sawmills in the two units are in central Florida.

Table 11. - Number of sawmills, amount of lumber cut, and man-days of employment in mills of various sizes, 1936

Daily (10 hrs.) rated capacity	Sawmills	Lumber cut				Employment
		Pine	Hardwood	Cypress	Total	
<u>Thousand board feet</u>	<u>Number</u>	<u>Thousand board feet</u>				<u>Thousand man-days</u>
Under 20	189	92,500	3,800	10,700	107,000	369
20 - 39	22	58,900	5,900	14,200	79,000	259
40 - 79	6	34,100	700	32,100	66,900	241
80 and over	2	40,900	-	900	41,800	199
Total	219	226,400	10,400	57,900	294,700	1,068
Total all capacities:						
Central Florida	169	148,000	10,400	51,700	210,100	769
South Florida	50	78,400	-	6,200	84,600	299

Most of the lumber cut is of excellent quality, finding ready markets locally (especially in the Miami and Tampa districts), as well as in the North and in foreign countries. In 1936 the sawmills of this area, although operating at less than half their capacity (which had been greatly expanded during the building "boom"), furnished over a million 10-hour man-days of employment, equivalent to about 4,000 steady jobs (assuming 250 days of work per year). The total lumber cut by the mills of this area, regardless of the source of the stumpage, amounted in 1936 to 295 million board feet, green lumber tally, of which 77 percent was pine, 20 percent cypress, and 3 percent hardwood.

Other wood-products industries

In 1936 this area had 21 veneer mills, 2 treating plants, and 14 miscellaneous plants, most of which were small shingle mills; practically all of these are in central Florida. The veneer mills are unusually important locally, for there is a keen demand for crates, hampers, and other veneer packages for the large crops of citrus fruit and vegetables produced in the area. Approximately half the cut of the veneer mills is from pine and the other half from the hardwoods, principally red and black gums, magnolia, and bay. All wood-products industries together furnished in 1936 almost 2 million man-days of employment—equivalent to regular employment for about 8,000 men (table 12).

Table 12. - Wood-products production and employment, 1936

Kind of plant or commodity	Units produced ^{1/}	Thousand man-days (10 hours) of employment		
		In woods	At plant	Total
Lumber	294,700 M board feet	442	626	1,068
Veneer	68,800 M board feet	118	161	279
Naval stores	14,550 units	244	14	258
Cross ties	928 M pieces	127	-	127
Poles and piles	10 M pieces	1	-	1
Fence posts	317 M pieces	5	-	5
Fuel wood	399,400 cords	205	-	205
Miscellaneous (shingle mills, treat- ing plants ^{1/} , etc.)	5,900 cords	3	31	34
Total		1,145	832	1,977
Total man-days:				
Central Florida		891	666	1,557
South Florida		254	166	420

^{1/} Labor in treating plants is entirely at the plant. The units of material treated are included in the respective commodities.

Commodity Drain from the Growing Stock

As previously stated, the net increment, which is computed for the growing-stock material only, is the net increase of the forest before deduction is made for drain. The commodity drain consists of the volume removed from the growing stock for the production of lumber, poles, ties, veneer, fuel wood, etc., together with the usable volume left in the woods as waste from the trees cut. In order that it may later be compared with increment, commodity drain is expressed as (1) drain, measured in board feet, from the saw-timber trees of the growing stock, and (2) the over-all drain, measured in cubic feet, from the entire growing stock — from trees below saw-timber size as well as from the larger trees. From saw-timber material alone the commodity drain for 1936 amounted to 456 million board feet, green lumber tally, of which about three-fourths came from central Florida and one-fourth from south Florida (table 13). Considering the area as a whole, 70 percent of the saw-timber drain is for lumber, 15 percent for veneer, 12 percent for cross ties, and 3 percent for other products. More than half the saw-timber drain comes from pines; and the drain from cypress is more than twice that from hardwoods. In spite of the growing importance of the second-growth volume component of the stands, by far the greater part of the raw material is still taken from old-growth stands.

From all growing-stock material, i.e., the usable volume in all sound trees 5.0 inches d.b.h. and over, including trees of sawlog size, as well as the usable upper stems of pine, the over-all commodity drain amounted to 80 million cubic feet of wood (inside bark). The commodities derived as byproducts are charged to the primary use for which the trees are felled; thus fuel

wood obtained from the upper stems of pine trees cut for lumber is included under the lumber-drain item shown in cubic feet.

Table 13. - Commodity drain from the growing stock, 1936

Reason for drain	From saw-timber material				From all growing-stock material
	Species-group			Total	
	Pines	Hardwoods	Cypress		
<hr/>					
	- - <u>Thousand bd.ft. (green lumber tally)</u> - -				<u>Thousand cubic feet (i.b.)</u>
Lumber	228,500	11,200	79,700	319,400	55,330
Cross ties	19,100	100	34,300	53,500	8,980
Poles and piles	300	-	100	400	60
Veneer	36,600	33,300	-	69,900	10,880
Fuel wood	5,500	1,500	-	7,000	3,150
Miscellaneous <u>1/</u>	3,300	1,000	1,400	5,700	1,850
	<hr/>				
Total	293,300	47,100	115,500	455,900	80,250
	<hr/>				
Total drain:					
Central Florida	185,800	46,900	100,500	333,200	56,120
South Florida	107,500	200	15,000	122,700	24,130

^{1/} Includes domestic farm use, fence posts, and land clearing.

Comparison of Net Increment and Commodity Drain

From Jan. 1, 1934, to Jan. 1, 1937, the commodity drain so greatly exceeded the net increment that there was a diminution in the growing stock of about 13 percent for saw timber alone, or over 5 percent for all growing-stock material (table 14). Considering only the saw-timber component of the growing stock, in 1936 the total commodity drain was 273 million board feet in excess of net increment—an over-cutting of 189 million board feet in central Florida and 84 million board feet in south Florida (table 15 and fig. 9). In each of the species-groups for the entire area, the commodity drain exceeded the corresponding net increment in saw timber.

As already pointed out, although the great majority of the trees are below sawlog size (fig. 3), the net increment of all growing-stock material in all sound trees 5.0 inches d.b.h. and larger, fails to meet the present demand for forest products. In 1936 the net increment (after the excessive mortality had taken an amount equivalent to 40 percent of the total growth in trees 5 inches d.b.h. and larger) was 36 million cubic feet (inside bark) less than the drain. It is recognized that the net annual increment is low—the natural result of light stocking, high prevalence of poor sites, heavy mortality due to the widespread custom of burning the woods, and other causes.

Table 14. - Changes in the growing stock

Date	Saw-timber material			Total	All growing-stock material
	Species-group				
	Pines	Hardwoods	Cypress		
<div>- - <u>Thousand board feet (green lumber tally)</u> - - <u>Thousand cubic feet (i.b.)</u></div>					
Jan. 1, 1934	3,808,100	682,200	1,375,200	5,865,500	1,871,060
Jan. 1, 1935	3,663,000	668,200	1,304,600	5,635,800	1,841,240
Jan. 1, 1936	3,508,200	655,100	1,232,000	5,395,300	1,808,310
Jan. 1, 1937	3,350,700	629,900	1,141,600	5,122,200	1,772,030

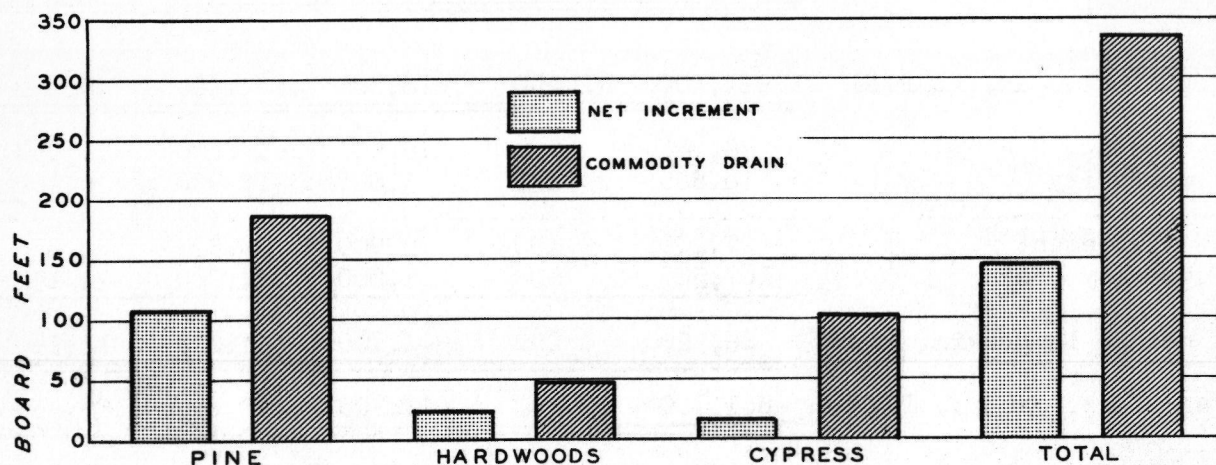


CHART A - CENTRAL FLORIDA

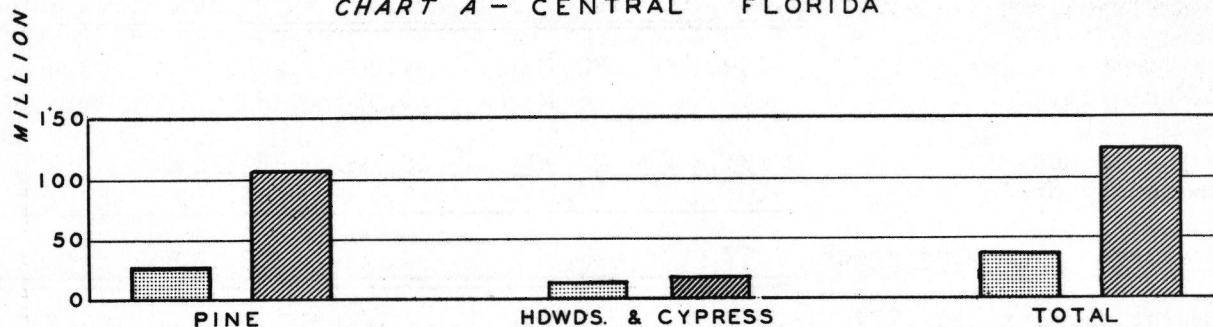


CHART B - SOUTH FLORIDA

FIGURE 9 - COMPARISON OF NET INCREMENT OF SAWLOG-SIZE TREES WITH THE COMMODITY DRAIN, 1936.

Table 15. - Comparison of net increment with commodity drain in board feet and cubic feet, 1936

Item	Saw-timber material				All grow- ing-stock material
	Species-group			Total	
	Pines	Hardwoods	Cypress		
	M board feet (green lumber tally)				M cu.ft. (i.b)
Central Florida:					
Growing stock, Jan. 1, 1936	2,566,800	642,900	613,200	3,822,900	1,311,200
Growth	161,400	30,200	19,700	211,300	57,470
Mortality	52,800	8,700	5,500	67,000	23,370
Net increment	108,600	21,500	14,200	144,300	34,100
Commodity drain	185,800	46,900	100,500	333,200	56,120
Net change in growing stock	-77,200	-25,400	-86,300	-188,900	-22,020
Growing stock, Jan. 1, 1937	2,489,600	617,500	526,900	3,634,000	1,289,180
South Florida:					
Growing stock, Jan. 1, 1936	941,400	12,200	618,800	1,572,400	497,110
Growth	38,000	500	15,900	54,400	15,890
Mortality	10,800	100	5,000	15,900	6,020
Net increment	27,200	400	10,900	38,500	9,870
Commodity drain	107,500	200	15,000	122,700	24,130
Net change in growing stock	-80,300	200	-4,100	-84,200	-14,260
Growing stock, Jan. 1, 1937	861,100	12,400	614,700	1,488,200	482,850
Entire area:					
Growing stock, Jan. 1, 1936	3,508,200	655,100	1,232,000	5,395,300	1,808,310
Growth	199,400	30,700	35,600	265,700	73,360
Mortality	63,600	8,800	10,500	82,900	29,390
Net increment	135,800	21,900	25,100	182,800	43,970
Commodity drain	293,300	47,100	115,500	455,900	80,250
Net change in growing stock	-157,500	-25,200	-90,400	-273,100	-36,280
Growing stock, Jan. 1, 1937	3,350,700	629,900	1,141,600	5,122,200	1,772,030

Practically all the saw-timber drain comes from old-growth trees, whereas these trees contribute only a small part of the net increment. With very rapid over-cutting in the old-growth conditions, many of the large saw-mills (40 M and over per day capacity), which are efficiently operated only when large blocks of high-quality saw timber are available, are gradually cutting out. These mills account for about one-third of the lumber cut, and their closing down should reduce somewhat the existing unfavorable discrepancy between drain and increment in saw-timber material. On the other hand, the lively local demand for building material and veneers for packaging may encourage the establishment of small transient mills to replace the larger mills, and there may be no permanent decrease in the drain.

Summary of the Forest Situation

The area covered by this report comprises two sections of the lower peninsula of Florida that differ markedly from each other in topography, soil, and drainage, and consequently also in vegetative cover. An east and west line drawn along the northern boundary of Charlotte, Glades, and Martin Counties separates these two regions into "central Florida" and "south Florida," and in a general way marks the southern limit of optimum growing conditions for the commercial forest types characteristic of the lower South. The two sections combined comprise about 18 million acres, of which 46 percent is classified as productive forest land. Longleaf and slash pine types predominate, with cypress, hardwoods, and loblolly pine types occurring in decreasing frequency in the order named. The volume included in the sound-tree growing stock is over 5 billion board feet, green lumber tally. Although old-growth forest stands occupy less than one-tenth of the forest area, 46 percent of the saw-timber volume is found in such stands. Compared with other areas in the South, these two sections of Florida are characterized in general by poor forest sites. While the saw-timber stands are lightly stocked with a comparatively small volume per acre, they are, generally speaking, accessible and easily logged. Another outstanding feature is the high proportion (41 percent) of forest land that has been stripped of its forest growth and has failed to restock. The combination of poor sites, light stocking, and high proportion of clear-cut land results, therefore, in a very low annual net forest increment.

South Florida

South Florida has less than 30 percent of the total saw-timber volume of the entire area. Its few good stands of saw timber, largely in the old-growth condition, because of the brisk demand for building and packaging materials, are being liquidated rapidly and generally with inadequate provision for restocking. When the remaining supply of merchantable forest material has been removed, it appears unlikely that the forests of the section will be of interest from a commercial standpoint for many years to come. This does not mean, however, that these forests will not be important in the economy of south Florida. On the contrary, these picturesque forests may be of more value to this attractive winter playground as a part of its natural scenery and as cover for wild life than are the forest industries that are being displaced. The Big Cypress Swamp, on the west flank of the Everglades, contains probably the largest primitive area of old-growth cypress in the United States. Over 600,000 acres of

unappropriated Federal and State land, part of which is forest land, is reported as reserved for inclusion in an "Everglades Natural Park."

Central Florida

Growing conditions are better in central Florida than in south Florida, although they are somewhat below the average for the lower South as a whole. Approximately six times as much land in this section is devoted to forests as to crop land and improved pasture. It is generally believed that, for some years at least, the need for more crop land will not reduce materially the present forest acreage. Recently there has been an increase in the use of land for cattle grazing, which if continued might retard or prevent the restocking to forests of the large acreage of clear-cut land now found. It might also result in a type of land management that would place timber growing second to grazing in some of the area now stocked to timber.

The population of central Florida, which was 515,000 in 1930, has been increasing rapidly in recent decades; since a considerable part of the increase is due to the attractions of its climate and scenery, this growth may be expected to continue. There is an excellent local market for lumber used in building and for veneer stock used in the manufacture of packages for the large citrus and vegetable industries. Within the section there are 169 sawmills and many other wood-using plants, whose products are used both locally and in more distant markets. The gum-turpentine industry, here appearing as the southernmost outpost of the widespread naval stores belt, is represented by 23 turpentine stills.

The outstanding preoccupation of this section of Florida is its tourist business, and the forests of the section constitute no small part of the many natural factors that make this part of the State so attractive to both winter and summer visitors. Although difficult to express tangibly in dollars and cents, this value is probably greater in the long run than that to be derived from the purely industrial use of the forests. This situation calls for forest management that, while yielding all of the industrial value possible, will at the same time preserve the attractiveness of the countryside and its recreational values.

Deficiencies in the present forests of central Florida

The outstanding deficiency in the present forests is that nearly half of the forest lands were harvested too clean, and have been burned over too frequently, since the timber was removed to allow the reestablishment of forest cover. Except for such usage as open-range grazing for cattle, these lands are virtually idle, produce no income to their owners, and are frequently tax delinquent. If these lands are to be returned to usefulness as producers of timber, much of the area will require the planting of trees, although undoubtedly a part of the cut-over area will restock naturally if effective protection from fire is afforded.

The forest stands of central Florida are deficient also in that they are sparsely stocked; many areas contain only a small fraction of the number of trees of valuable species that the soil and the climate can support. Good forest management and effective fire protection for a number of decades

would increase greatly the stocking and improve its quality. Sparse, open stands are found not only in old-growth timber but also in many areas of second growth. The net annual increment for the forest averages only 24 board feet per acre—an annual growth far below the potentialities of the sites involved.

Measures for improving these forests

A high degree of fire control is absolutely essential in the management of Southern forests, and this is particularly true in central Florida. The prevalence of the old pioneer habit of burning the woods is directly responsible for the thin stands and the low increment found in these forests. No amount of good forest management can be expected to improve materially this situation unless the forest stands can be afforded a reasonable degree of protection from fire. Notwithstanding the fact that landowners here, as elsewhere, may receive cooperative assistance in fire protection from the State and Federal Governments under the provisions of the Clark-McNary Law, in 1936 it is reported that only one-tenth of the forest lands in central Florida were under organized fire protection.

Timber theft also is a widespread evil, with non-resident owners the chief sufferers, although resident owners are by no means immune. Better enforcement of the timber-theft laws and heavier penalties are needed.

About 700,000 acres of forest land has been so severely harvested that it contains an insufficient number of seed trees to restock the area naturally. In addition there are two million acres of clear-cut land with seed trees but which, even with fire protection, will require a long time for commercial forests to reestablish themselves. Artificial reforestation will be necessary if these lands, now idle and a drag on the economic prosperity of the section, are to be restored quickly to valuable forest uses. About 267 plantations, involving an aggregate area of more than 5,000 acres, have been established by landowners in central Florida, largely through the encouragement and assistance of the Florida Forest and Park Service. These small plantations have demonstrated that in the main excellent results may be obtained by planting.

Good management of existing stands of timber, both old and young, is necessary if the forests are to yield their greatest returns. In this section of the State, turpentine (now largely in second-growth stands) often involves such injurious practices as cupping small trees, hanging too many cups on the trees, and chipping too deeply. As a result, the mortality of the trees in the turpentine orchards is excessive. Conservative measures of turpentine now in general practice among progressive operators throughout the naval stores belt, if applied here, will not only reduce the unnecessarily high annual loss of faces and trees but will increase the rate of gum production.

Since its local timber supply means so much to this section of the State, the highest degree of thriftiness and economy in its use is justified. As a result of past turpentine and the high prevalence of fire, many stands contain large numbers of worked-out and abandoned turpentine trees and cull trees of all species. At the time of the survey, about 5 million cords of usable wood were estimated to be in these undesirable com-

ponents of the stands. The removal of these trees not only would improve greatly the growing conditions of the remaining stands but also would meet a large part of the local wood requirement. Closer utilization of all the trees cut, by reducing the waste now left in the woods to rot, would tend to lengthen the present extensive drain upon the forest growing stock. To utilize the available material to the best advantage, a much greater effort should be made to devote each item of forest output to its highest use; every tree cut should go into those products that bring the greatest return.

The Need for a Land-Use Study

Both central and south Florida, the two sections covered in this report, should be the subject of an intensive land-use study. This part of the State is developing rapidly, and if its future is to be based upon the sound use and development of its natural resources, there should be a careful correlation of land use with the requirements of such activities as the tourist business, citrus and vegetable growing, cattle raising, and forestry. Such a study should include, among others, the answers to the questions: "What is going to become of the 3-1/2 million acres of cut-over land that has failed to restock and that is now lying as an unproductive eyesore?" "Is not the rehabilitation of this vast expanse of stump-land essential?" "And is its artificial reforestation a task for private ownership, or a responsibility of the general public?"

